We Claim:

1. A feedback control system for an electrospray nozzle communicating with a source of electrical potential and having a nozzle tip which is displaced from a counterelectrode, comprising

a source of light, with focusing optics, focused to intersect the one or more of the liquid cone, jet and plume of the fluid exiting the electrospray nozzle,

one or more photo detectors, configured individually or in an array and disposed to detect scattered light patterns, transmitted light patterns or both, passing through, reflected by or emitted from said liquid discharged from said electrospray nozzle as a result of the intersection of said source of light with said liquid, and generate photo-electronic signals in response thereto,

an electronic detection and amplification system adapted to convert said photo-electronic signals to electronic signals,

a first computer or microprocessor system programmed or adapted to interpret said electronic signals, and

a second computer or microprocessor system communicating with said first computer or microprocessor system, and adapted to generate a signal to a controller which will either adjust the distance between said electrospray nozzle and a counterelectrode by displacing said nozzle, said counterelectrode, or both, or change the voltage applied to said nozzle with respect to a counter electrode or mass spectrometer inlet.

2. The feedback control system of Claim 1, wherein said first computer or microprocessor system and said second computer or microprocessor system are combined into a single computer or microprocessor system.

3. The feedback control system of claim 1 wherein said electronic detection and amplification system is incorporated into said photo detector.

4. The feedback control system of claim 1, wherein said photo detector is a photo diode or CCD camera.

5. The feedback control system of claim 4 wherein said photo detector is a CCD camera and said CCD camera is combined with a microscope.

6. The feedback control system of claim 5, wherein said source of light is a continuous source of light and said controller is adapted to change

the voltage applied to said nozzle with respect to a counter electrode or mass spectometer inlet.

7. The feedback control system of claim 6 wherein said control system is a static control system, said first computer is programmed with a first algorithm for empirical image measurement, said first algorithm being responsive to the image of an electrospray plume, and a second algorithm for generating and maintaining conditions in said electrospray plume to produce a predetermined image of said electrospray plume.

8. The feedback control system of claim 7, wherein said second algorithm is adapted to control an electrical power supply to said electrospray nozzle and adjust the voltage provided by said electrical power supply to maintain said electrospray plume in a cone-jet mode.

9. The feedback control system of claim 7, wherein said second algorithm is adapted to control an electrical power supply to said electrospray nozzle and adjust the voltage provided by said electrical power supply to maintain said electrospray plume in a dripping mode.

10. The feedback control system of claim 6 wherein said electrospray nozzle is a multi-jet nozzle, said control system is a static control system, said first computer is programmed with a first algorithm for empirical image measurement, said first algorithm being responsive to

the morphologies of a plurality of electrospray plumes emanating from said multi-jet nozzle, and a second algorithm for generating and maintaining predetermined morphological conditions in said electrospray plumes.

11. The feedback control system of claim 7, wherein said first algorithm is adapted to divide an image of an electrospray plume into a plurality of zones and count the number of edges within each of said zones.

12. The feedback control system of claim 7, wherein said first algorithm is an image comparison algorithm and said empirical image measurement which is a comparison of an image of said electrospray plume to a library of said images through pattern matching.

13. The feedback control system of claim 12 wherein said pattern matching is made by normalized cross-correlation analysis.

14. The feedback control system of claim 12 wherein said pattern matching is made by normalized cross-correlation analysis.

15. The feedback control system of claim 12 wherein said pattern matching is made by Fast Fourier Transform correlation analysis.

16. The feedback control system of claim 12 wherein said pattern matching is made by image understanding using geometric modeling and non-uniform image sampling.

17. The feedback control system of claim 2, wherein said source of light is a pulsed or strobed light source.

18. The feedback control system of claim 17, wherein said light source is a pulsed light source and said pulsed light source is an LED, having a pulse duration of less than 10 μS.

19. The feedback control system of claim 17, wherein said light source is a strobed source and said strobed light source is a flashlamp having a pulse duration of less than 10 μS.

20. The feedback control system of claim 17, wherein said light source is a pulsed light source and said pulsed light source is a pulsed laser having a pulse duration of less than 10 μS

21. The feedback control system of claim 2, wherein said electrospray nozzle is supplied with a mobile phase and analyte from a liquid chromatograph and discharges an electrospray of said mobile phase and analyte to a mass spectrometer.

22. The feedback control system of claim 2, wherein said electrospray nozzle is supplied with a mobile phase and analyte from a capillary electrophoresis unit and discharges an electrospray of said mobile phase and analyte to a mass spectrometer.

23. The feedback control system of claim2, wherein said controller is adapted to adjust the distance between said electrospray nozzle and a counterelectrode by displacing said nozzle, said counterelectrode, or both.

24. The feedback control system of claim 8, wherein said electrospray nozzle is supplied with a mobile phase comprising a material for deposition as a thin film, and said counterelectrode is a flat or curved surface upon which a thin film of said material is deposited by said electrospray nozzle.

25. The feedback control system of claim 9, wherein said electrospray nozzle is supplied with a mobile phase comprising a material for deposition as discrete droplets, and said counterelectrode is a flat or curved surface upon which discrete droplets of said material are deposited by said electrospray nozzle

26. The feedback control system of claim 20, wherein said counterelectrode is a substrate suitable for analysis by matrix assisted laser desorption ionization (MALDI) mass spectrometry.

27. . The feedback control system of claim 21, wherein said counterelectrode is a substrate suitable for analysis by matrix assisted laser desorption ionization (MALDI) mass spectrometry

28. The feedback control system of claim 26 wherein said substrate is stainless steel or gold coated stainless steal treated with a MALDI chemical matrix, or porous silicon.

29. The feedback control system of claim 27 wherein said substrate is stainless steel or gold coated stainless steal treated with a MALDI chemical matrix, or porous silicon

30. The feedback control system of claim 2 wherein said electrospray nozzle is an electrically conductive capillary nozzle and said power supply is connected directly to it.

31. The feedback control system of claim 2 wherein said electrospray nozzle is an electrically insulating capillary nozzle and said power supply is connected to the liquid mobile phase within said nozzle through an electrode.

32. The feedback control system of claim 2, wherein said electrospray nozzle is incorporated into or onto a planar substrate of glass, plastic or silicon.

33. A feedback control system for an electrospray nozzle which is held at ground potential, having a nozzle tip which is displaced from a counterelectrode which communicates with a source of electrical potential, comprising

a source of light, with focusing optics, focused to intersect the one or more of the liquid cone, jet and plume of the fluid exiting the electrospray nozzle,

one or more photo detectors, configured individually or in an array and disposed to detect scattered light patterns, transmitted light patterns or both, passing through, reflected by or emitted from said liquid discharged from said electrospray nozzle as a result of the intersection of said source of light with said liquid, and generate photo-electronic signals in response thereto,

an electronic detection and amplification system adapted to convert said photo-electronic signals to electronic signals,

a first computer or microprocessor system programmed or adapted to interpret said electronic signals, and

a second computer or microprocessor system communicating with said first computer or microprocessor system, and adapted to generate a

signal to a controller which will either adjust the distance between said electrospray nozzle and a counterelectrode by displacing said nozzle, said counterelectrode, or both, or change the voltage applied to said counterelectrode with respect to said nozzle.

34. The feedback control system of Claim 33, wherein said first computer or microprocessor system and said second computer or microprocessor system are combined into a single computer or microprocessor system

35. The feedback control system of claim 2 wherein said source of light is a continuous source of light focused to intersect said jet and said one or more photodetectors is provided with an amplifier that generates a waveform and feeds said waveform to said computer.

36. The feedback control system of claim 2, wherein electrospray nozzle is surrounded by an electrical field and, said computer has an analysis algorithm based on an empirical measurement algorithm in communication with a control algorithm adapted to control the mode of the electrospray by controlling the strength of said electrical field.

37. The feedback control system of claim 35, wherein said empirical analysis algorithm generates and analyzes a frequency spectrum of said waveform.

38. The feedback control system of claim 36, wherein said empirical analysis algorithm analyzes the fundamental frequency of the waveform.

39. The feedback control system of claim 35, wherein electrospray nozzle is surrounded by an electrical field, the computer is programmed with an analysis algorithm based on a waveform comparison algorithm which compares the waveform generated by said amplifier to a library of reference waveforms, and said analysis algorithm communicates with a control algorithm which adjusts the intensity of said electrical field to maintain a predetermined spray mode.

40. The feedback control system of claim 38 wherein said waveform comparison algorithm is based on pattern matching.

41. The feedback control system of claim 39, wherein the pattern matching is based on cross-correlation analysis of the actual waveform and reference waveforms.

42. The feedback control system of claim 35, wherein said continuous source of light is a laser.

43. The feedback control system of claim 42 wherein said laser is a diode laser.

44. The feedback control system of claim 43 wherein said diode laser operates at wavelengths between 600 and 1300 nm.

45. The feedback control system of claim 42 wherein said laser is coupled to an optical fiber.

46. The feedback control system of claim 35, wherein said photo-detector is a photodiode.

47. The feedback control system of claim 46 wherein said photo-detector has an integral current amplifier having a bandwidth of greater than 100 kHz.

48. The feedback control system of claim 46 wherein said photo-detector is dual detectors having channels coupled to a differential amplifier which feeds the waveform to the computer.

49. The feedback control system of claim 46 wherein said photo-detector is a photodiode array, communicating with an array amplifier.

50. The feedback control system of claim 2, wherein said light source is two lasers coupled to optical fibers, light from the optical fibers is focused by a lens into two individual beams, one of which intersects the jet and the other of which intersects the plume, each of said beams

is then detected by a photodiode, and two waveforms are sent to the computer.

51. The feedback control system of claim 35, wherein said one or more photo detectors is one photo detector combined with a lens and a pinhole aperture and , the light source is a laser beam and focusing lens and the light source and the photo detector are in confocal alignment.

52. The feedback control system of claim 35 comprising a laser, beam splitter, a single lens, pinhole and photodetector; the beam splitter being at or near the back focal plane of the lens, wherein said a single lens system delivers light from the laser and collects light for the photodetector in an epi-confocal arrangement.

53. The feedback control system of claim 2, wherein said source of light comprises one or two sources of light and produces two beams of light, one of said beams being focused on the jet and the other being focused on the plume and said one or more photo detectors comprises a first photo detector which detects the light passing through said plume and a second photo detector which detects the light passing through said jet.

54. The feedback control system of claim 53, wherein said source of light is a first source of light focused to illuminate part or all of the field of view of the first photo detector and a second source of light focused to

intersect said jet, said first source of light being a pulsed source of light and said second source of light being continuous source of light, said first photo detector is a CCD Camera & microscope arrangement and said second photo detector is a photo diode.

55. The feedback control system of claim 54, wherein said pulsed source of light is an LED having a pulse duration of less than 10 μS.

56. The feedback control system of claim 53, wherein said source of light is a first source of light focused to illuminate part or all of the field of view of the first photo detector and a second source of light focused to intersect said jet, said first source of light and said second source of light being continuous sources of light, said first photo detector is a CCD Camera & microscope arrangement and said second photo detector is a photo diode.